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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/884,291

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EXAMINER

ALI, SYED J

ART UNIT

PAPER NUMBER

2195

DATE MAILED: 01/18/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/884,291

Applicant(s)

CZAJKOWSKI ET AL.

Examiner

Syed J. Ali

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 October 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This office action is in response to the amendment filed October 21, 2005. Claims 1-21 are presented for examination.

2. The text of those sections of Title 35, U.S. code not included in this office action can be found in a prior office action.

Specification

3. The title of the reference listed on page 2 of the specification is incorrect. The proper title of the Ungar reference (cited on attached PTO-892) is "Generation Scavenging: A Non-Disruptive High Performance Storage Reclamation Algorithm."

Claim Objections

4. **Claims 1, 8, and 15 is objected to because of the following informalities:**

a. In line 19 of claim 1, line 21 of claim 8, and line 24 of claim 15, "other task space" should read "other task spaces".

b. In line 16 of claim 15, a semicolon should follow "memory".

Appropriate correction is required.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it

pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

6. **Claims 1-21 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement.**

7. The claims contain subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention.

8. Claims 1, 8, and 15 recite the newly added limitation of continuing normal execution of tasks without interruption due to “subsequent memory compaction.” The specification contains no discussion of “memory compaction” (or “defragmentation”, the term used to describe compaction in the arguments). Accordingly, this limitation is treated as new matter. Claims 2-7, 9-14, and 16-21 contain new matter for at least the same reasons as their parent claims.

Claim Rejections - 35 USC § 103

9. **Claims 1-3, 8-10, and 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Haggar et al. (US 2002/0091904) (hereinafter Haggar) in view of Shaylor (US 2002/0108025).**

10. As per claim 1, Haggar teaches the invention as claimed, including a method for managing heap memory in a multitasking system, comprising:

reserving a guaranteed amount of heap memory for a task from a common heap in the multitasking system (paragraph 0006);

receiving a request from the task to allocate heap memory for a new object (paragraphs 0006-0009, 0023, 0033); and

if heap memory is available in the guaranteed amount of heap memory for the task, allocating heap memory for the new object from the guaranteed amount of heap memory (paragraph 0007, 0033);

if not, checking if surplus heap memory is available in the common heap (paragraph 0034);

if so, reserving an additional amount of heap memory to the task from the common heap and allocating heap memory for the new object from the additional amount of heap memory (paragraph 0035), whereby allocating heap memory for the new object from the additional amount of heap memory delays garbage collection (paragraphs 0010, 0042); and

if not, performing garbage collection on the heap memory reserved for the task, wherein the task space is separate from all other task spaces, whereby other tasks continue normal execution without interruption due to garbage collection or subsequent memory compaction (paragraphs 0040-41).

11. Shaylor teaches the invention as claimed, wherein the heap memory reserved for a task is separate from heap memory reserved for all other tasks in the common heap of a multitasking system (paragraphs 0035-0036).

12. Haggar discusses dynamically increasing the size of a memory heap in response to a request from a program that exceeds the available memory. This provides benefits in terms of delaying garbage collection and increasing the processing efficiency of the computer. Shaylor provides an improvement upon this memory allocation scheme by allocating a separate portion

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of physical memory for each task (paragraphs 0035-0036) and dynamically increasing the size of the allocated memory while a task is executing (paragraph 0038). It would have been obvious to one of ordinary skill in the art to combine Haggar and Shaylor since both address the deficiencies of known dynamic memory allocation methods. Both seek to provide a way of allocating memory to virtual machines to accommodate memory requests at runtime, where virtual machine tasks tend to have changing memory requirements over the course of execution.

13. As per claim 2, Haggar teaches the invention as claimed, including the method of claim 1, wherein if surplus heap memory is not available in the common heap in addition to heap memory allocated to tasks, the method further comprises:

performing garbage collection on heap memory to reclaim unused reserved heap memory (paragraph 0024, 0039), and

allocating heap memory for the new object from reclaimed surplus heap memory (paragraph 0024, 0039).

14. As per claim 3, Haggar teaches the invention as claimed, including the method of claim 1, wherein reserving the guaranteed amount of heap memory from the common heap includes:

determining if there is sufficient heap memory available in the common heap (paragraphs 0033, 0039); and

if not, performing garbage collection to reclaim allocated surplus heap memory (paragraph 0024, 0039), and

reserving heap memory for the task from reclaimed heap memory (paragraph 0024, 0039).

15. As per claims 8-10, Haggar teaches the invention as claimed, including a computer-readable storage medium storing instructions that when executed by a computer causes the computer to perform the method of claims 1-3, respectively (Fig. 2).

16. As per claims 15-17, Haggar teaches the invention as claimed, including an apparatus that facilitates managing surplus computer heap memory in a multitasking system comprising the method of claims 1-3, respectively (Fig. 2).

17. Claims 4-7, 11-14, and 18-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Haggar in view Shaylor in view of Otis (US 2002/0099765).

18. As per claim 4, Otis teaches the invention as claimed, including the method of claim 1, wherein heap memory in the common heap is managed using a generational garbage collector (paragraph 0048).

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19. It would have been obvious to one of ordinary skill in the art to combine Haggard, Shaylor, and Otis since a generational memory organization and garbage collector allows objects that are commonly referenced to have a more permanent position in the memory. Those objects that are not referenced often are the first to be reclaimed, thereby decreasing the overall computation cost associated with garbage collection (Otis, paragraph 0008). Additionally, Haggard indicates that any garbage collection technique may be used to manage the memory or detect unused heap memory (Haggard, paragraph 0040).

20. As per claim 5, Otis teaches the invention as claimed, including the method of claim 4, wherein a plurality of tasks share an old generation of the generational garbage collector (paragraphs 0049, 0052).

21. As per claim 6, Otis teaches the invention as claimed, including the method of claim 5, wherein each task of the plurality of tasks has a new generation of the generational garbage collector belonging to the task (paragraphs 0052-0053).

22. As per claim 7, Otis teaches the invention as claimed, including the method of claim 4, wherein the generational garbage collector is a copying garbage collector (paragraphs 0055, 0060).

23. As per claims 11-14, Haggar teaches the invention as claimed, including a computer-readable storage medium storing instructions that when executed by a computer causes the computer to perform the method of claims 4-7, respectively (Fig. 2).

24. As per claims 18-21, Haggar teaches the invention as claimed, including an apparatus that facilitates managing surplus computer heap memory in a multitasking system comprising the method of claims 4-7, respectively (Fig. 2).

Response to Arguments

25. **Applicant's arguments filed October 21, 2005 have been fully considered but they are not persuasive.**

26. Applicant argues that the claimed invention is patentably distinct from the combination of Haggar and Shaylor since the combination thereof "*interleaves tasks spaces and thus causes one task to halt another during memory maintenance processes such as memory compaction.*"

27. Applicant begins the arguments by discussing typical garbage collection methods and memory compaction techniques, thereafter challenging the use of the Haggar reference for using these techniques. In an effort to circumvent the reference, Applicant has included new limitations in the claims (see numbered paragraphs 7-8 above) that appear to be included in response to disclosures in Haggar. These claim amendments are improper as they are without support in the original specification.

Nonetheless, Applicant alleges that the combination of Haggar and Shaylor is deficient because the garbage collection mechanism shown requires pausing of tasks that are run in the address space being collected. Moreover, Applicant alleges that Shaylor cannot remedy the deficiencies of Haggar because Shaylor discusses relocating task address spaces, which would require pausing tasks that have references to the memory location to which the task memory space is relocated.

First, it should be noted that Haggar is not relied upon as a stand-alone reference. It is a settled principle that one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091 (Fed. Cir. 1986). The memory allocation mechanism of Haggar allocates all objects within a unified address space, i.e. there are not separate memory regions for separate tasks. This deficiency has been noted, and Shaylor is cited to remedy this. When the combination of references is considered, the allocation scheme disclosed by Haggar can essentially be thought of as particular to a task. In other words, if the memory region is reserved for a single task, when garbage collection is performed it is only performed on the address space of a single task, as claimed. This does not require other tasks be paused, as they do not reference memory locations reserved to another task. This leaves open the question of what the allocation mechanism is to do when there is insufficient memory in the reserved space, but sufficient space exists in the common heap. Shaylor also provides a solution to this problem, by allowing the address space reserved to a task to be expanded (Abstract).

Conclusion

28. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Syed J. Ali whose telephone number is (571) 272-3769. The examiner can normally be reached on Mon-Fri 8-5:30, 2nd Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Meng-Ai T. An can be reached on (571) 272-3756. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Syed Ali
January 9, 2006



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